a second plurality of NDC sites, the stored dataset whose access is terminator site, a request from the client sites for access to the stored dataset being received by a third plurality of NDC client requested by the client sites being stored at an NDC server terminator sites, each NDC site including:

- (a) an NDC that has an NDC buffer;
- (b) means for the NDC to receive the request to access the stored dataset;
- determine if a projected image of data requested from the stored dataset is (c) means for the NDC to check the NDC buffer at this NDC site to already present there, wherein:
- i. if the NDC buffer of this NDC site does not contain a projected image the NDC server terminator site for the stored dataset, the NDC includes downstream to another NDC site closer to the NDC server terminator of all data requested from the stored dataset, and if this NDC site is not means for transmitting a request for data from this NDC site site for the stored dataset than the present NDC site;
- including means for accessing the stored dataset to project an image of image of all data requested from the stored dataset, and if this NDC site if the NDC buffer of this NDC site does not contain a projected is the NDC server terminator site for the stored dataset, the NDC the requested data into the buffer of this NDC; and
- which the returning NDC site first returned the data, whereby images iii. if the NDC buffer of an NDC site contains a projected image of all requested from this NDC site upstream to the NDC site from which this retaining a copy of the returned data that the returning NDC site may NDC site received the request, whereby through a succession of such requested data ultimately arrives at the NDC client terminator site, returns of data from one NDC site to the next upstream NDC site the of the stored dataset may be projected concurrently from a single NDC each NDC site that returns data upstream to the requesting NDC site subsequently transmit to an NDC site other than the NDC site to requested data, the NDC including means for returning the data site into the third plurality of NDC client terminator sites; and

means for the NDC client terminator site to return the requested (d) means for the NDC client terminator site to return tne requedata to the client site that requested access to the stored dataset.

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### R E S E A R C H 113101

#### Three Ways to Deliver Cached Intranet and Internet Users Performance to Your

Senior Research Engineer Advanced Development Group

and interact connections has improved new requirements that seem to be in crealist; with these efforts to enlance network performance. Comprehensive security restrictions, access cootrols, and creatent filtering performance pessiby in an covarsament where users are already frustrated by busy. Web servers and lang their systems using the most cost-effective means available. Yet the wickspread deployment of Internet Verwork engineers and administrations are constantly trying to squeeze the highest performance out of are crucial aspects of securing the intranct and connecting to the Internet, but they exact an additional response times.

infrastructure and office the performance penulty you pay for the necessary security controls and filtering. Novell's Border-Manager incluses an Internet object eache that significantly increases the speed of web access, in the process, this technology provides a performance foundation to support your

advantages of eaching in latranet and internet environments. It then describes three applications of This AppNose provides an overview of BorderManager's eaching technology and discusses the Navell's internet object cache that provide significant benefits to intranet and internet users:

- ----Proxy caching
- mm Web server acceleration

For more information on BorderManager and either AppNotes regarding these technologiess, visit the Smell Work Wick site at http://www.nowell.combordermanages

### What is Caching?

During the 1960s, computer designers discovered that much of the programs code their systems were executing was extremely repetitive—small portions of the code would be processed over and over again. Using this insight to their advantage, they began storing the repetitive portions of their programs in a

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(c) means for the NDC to check the NDC buffer at this NDC site to determine if a projected image of data requested from the stored dataset is already present there, wherein:

i. if the NDC buffer of this NDC site does not contain a projected image of all data requested from the stored dataset, and if this NDC site is not the NDC server terminator site for the stored dataset, the NDC includes means for transmitting a request for data from this NDC site downstream to another NDC site closer to the NDC server terminator site for the stored dataset than the present NDC site;

ii. if the NDC buffer of this NDC site does not contain a projected image of all data requested from the stored dataset, and if this NDC site is the NDC server terminator site for the stored dataset, the NDC including means for accessing the stored dataset to project an image of the requested data into the buffer of this NDC; and

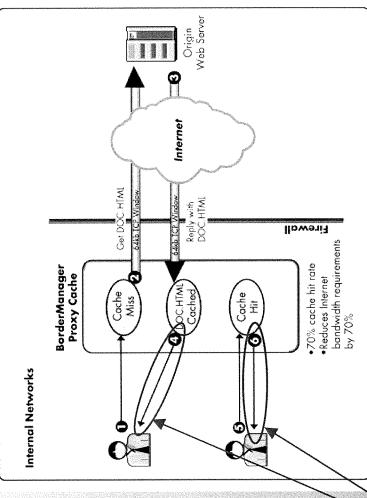
iii. if the NDC buffer of an NDC site contains a projected image of all requested data, the NDC including means for returning the data requested from this NDC site upstream to the NDC site from which this NDC site received the request, whereby through a succession of such returns of data from one NDC site to the next upstream NDC site the requested data ultimately arrives at the NDC client terminator site, each NDC site that returns data upstream to the requesting NDC site may subsequently transmit to an NDC site other than the NDC site to which the returning NDC site first returned the data, whereby images of the stored dataset may be projected concurrently from a single NDC site into the third plurality of NDC client terminator sites; and

(d) means for the NDC client terminator site to return the requested data to the client site that requested access to the stored dataset.

### How Proxy Cache Works

Figure 5 illustrates how BorderManager caches HTML documents and other cacheable content.

Figure 5: A proxy cache saves repeatedly-used objects to speed access and reduce Internet traffic



- A browser issues a request for a file named DOC.HTML. This request is sent to the proxy cache over a 10 Mbps Ethernet LAN segment. In this case, the request results in a "cache miss" because the proxy cache has never serviced a request for that document before.
  - has never serviced a request for that document before.

    The proxy cache initiates a request for DOC.HTML from the origin web server on behalf of the browser.
    This request is sent over a T1 line to an ISP, then traverses the Internet until it arrives at the origin server
    - Instructures is sentily early at 11 mile to all lost, when the enterthis much mainty at the origin web server responds to the proxy's request by sending DOC HTML. This transmission is much faster than a response to a browser due to the proxy's optimized receive window that can receive up to 64KB at one time and stays open to receive multiple responses. The proxy then places DOC HTML
      - in its cache. The proxy cache responds to the original browser request with DOC HTML.
- INSEX When the same browser (or any other browset) issues a request for UUC. HTML, the request results
  in a "cacka hit" because the proxy has kept a copy of the document in its cache.
  - In this case the proxy replies immediately to the browser request because it has DOC HTML in cache.
    The proxy's response is transmitted at 10 Mbps to the browser, eliminating the need to fetch the
    document again from the origin server on the Internet.

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### (a) an NDC that has an NDC buffer;

# (b) means for the NDC to receive the request to access the stored data

(c) means for the NDC to check the NDC buffer at this NDC site to determine if a projected image of data requested from the stored dataset is already present there, wherein:

i. If the NDC buffer of this NDC site does not contain a projected imag of all data requested from the stored dataset, and if this NDC site is not the NDC server terminator site for the stored dataset, the NDC includes means for transmitting a request for data from this NDC site downstream to another NDC site closer to the NDC server terminator site for the stored dataset than the present NDC site.

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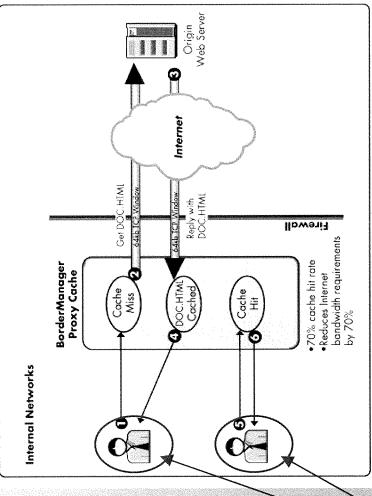
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### How Proxy Cache Works

Figure 5 illustrates how BorderManager caches HTML documents and other cacheable content.

Figure 5: A proxy cache saves repeatedly-used objects to speed access and reduce Internet traffic.



- A browser issues a request for a file named DOC HTML. This request is sent to the proxy cache over a 10 Mbps Ethernet LAN segment. In this case, the request results in a "cache miss" because the proxy cache has never serviced a request for that document before.
  - The proxy cache initiates a request for DOC.HTML from the origin web server on behalf of the browser.
     This request is sent over a T1 line to an ISP, then traverses the Internet until it arrives at the origin server
     The origin web server responds to the proxy's request by sending DOC.HTML. This transmission is
    - 3. The origin web server responds to the proxy's request by sending DOC.HTML. This transmission is much faster than a response to a browser due to the proxy's optimized receive window that can receive up to 64KB at one time and stays open to receive multiple responses. The proxy then places DOC.HTMI in its cache.
      - The proxy cache responds to the onginal browser request with DOCHTML

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- 5. Now when the same browser (or any other browset) issues a request for DOC HTML, the request results in a "cache hit" because the proxy has kept a copy of the document in its cache.
  - 6. In this case, the proxy replies immediately to the browser request because it has DOC HTML in cache. The proxy's response is transmitted at 10 Mbps to the browser, eliminating the need to fetch the document again from the origin server on the Internet.

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## MOVELL RESEARCH

## Three Ways to Deliver Cached Performance to Your Intranet and Internet Users

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Senior Research Engineer Advanced Development Group Network engineers and administrators are constantly trying to squeeze the highest performance out of their systems using the most cost-effective means available. Yet the wickspread dightymout of thatmet and intractive connections has imposed new requirements that seem to be in coeffict with these efforts to enhance network performance. Comprehensive security restrictions, access controls, and consent filtering are central aspects of securing the intranet and connecting is the Internet, but they exact an additional performance penalty in an environment where users are already finanticle by busy. Web servers and long resences times.

Novell's BenterManager includes an finemet object cirche that significantly increases the speed of web access, in the process, this technology provides a performance foundation is support your network infrastructure and offset the performance penalty you pay for the necessary security controls and filtering.

This AppNote provides an overview of BonderManager's caching technology and discusses the advantages of caching in Intranel and Internet environments. It then describes three applications of Novell's Internet object cache that provide significant benefits to intranet and Internet users:

- om Proxy caching
- --- Proxy cache hierarchies
- www.Web server accelerations

For more information on BorderManager and other AppNotes regarding these technologies, visit the Novell World Wide site at latter was unavell, combudatinaticaes.

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During the 1960s, computer designers discovered that much of the gregimin code their systems were executing was extremely repetitive—small pertions of the code would be processed over and over again. Using this insight to their advantage, they began storing the repetitive portions of their programs in a

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